Are design sciences, economics and behavioral sciences critical enough on AI? A debate between three voices within the IS discipline

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AI: A debate between three voices within the IS discipline. Are design sciences, economics and behavioral sciences critical enough on AI?

Panel

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Abstract

Even though AI technology providers and consultants are assuming a direct positive causality between these technologies and economic benefits, we claim that at least three IS research communities include some recalcitrant members who are challenging aspects of that optimistic discourse. For sake of simplicity, we are naming them as being scholarly members of the design, the economics, and the behavioral communities of IS research. In addition to these three debating voices, three dissenting voices will take critical positions on the questions at hand from radically different stances: the humanist voice, the societal voice and the iconoclastic pluralist voice. The voices will present their arguments within different business contexts. This panel will challenge the new "Age of AI," and help chart a reasonable IS perspective on the future of AI and its implications in our discipline.

Keywords: *AI, IS research, behavioral sciences, economics, design sciences, humanism, societal diffusion of technology, pluralism.*

Introduction

In a recent editorial, Rowe (2018) called out for more criticality and reflexivity in our discipline and encouraged "philosophizing." His primary rationale (among many) for such reflexivity is the "unusual

challenges" brought forth by the "digital transformation of society and related risks." One such digital transformation is owing to Artificial Intelligence (AI) which is commonly seen as the next digital frontier (Manyika 2017). A joint study of the Boston Consulting Group and the Sloan Management Review reports that 91% of executives expect that their companies will derive some notable value from AI in the next five years (Ransbotham et al. 2018). This sort of optimism is a familiar, and recurring one for the AI world. For example, in the 1970's, Herbert Simon had predicted that a similar outcome would occur within 10 years. Over the years, the dream surrounding AI has somewhat receded, but today, management and the consulting firms in the new age of AI are doubling up on the predictions of the past and declaring that the promised wonders of AI will be realized in approximately 5 years' time! Even though technology providers and consultants are assuming a direct positive causality between AI technologies and economic benefits, we propose that at least three IS research communities include some recalcitrant members who are challenging aspects of that optimistic discourse. For sake of simplicity, we are naming them as being scholarly members of the design, the economics, and the behavioral communities of IS research, which we discuss below. Our panel proposal is to present a lively, deeply felt debate by representatives of those three communities on the adequacy of the IS critique of the new "Age of AI," and to help chart a reasonable IS perspective on the future of AI and its implications in our discipline. Below, we characterize some of the distinctive concerns and issues that each participant in the panel may reflect during the debate. Please note that these are illustrative only and that the points each participant will raise will be up to their unique perspective and the dynamics of the debate once it begins.

A Debate by Voices from the Three IS Research Communities.

Design science is broadly grounded in a pragmatic philosophy with the purposeful research goal of improving the human condition via shaping IS solutions. The application of AI in the design of socio-technical systems tends to create complex (non-transparent) solutions for important research challenges. The burden of un-mastered system complexity leads to loss of intellectual control when it exceeds human capabilities for reasoning and analysis. Intellectual control means understanding system behaviors at all levels in all circumstances of use. A premise of the argument here is that design science must deal effectively with the messy complexity of real IS problems and solutions and, thus, avoid the reductionism found in much research that simplifies the problem space to one in which known theories and solutions readily apply (Hevner et al. 2004). The design approach draws historically from Simon (1996) who, in different arguments, oppose the optimistic approach that permeates traditional AI development. Weizenbaum (1976) elaborates on the philosophical debates concerning the pragmatic uses of AI in the design of human-computer systems. Another line of criticism that can be applied to the over-optimism of AI promoters is related to the economic-based research within the IS discipline. This approach identified an underlying IT paradox and chronic implementation gaps in advanced IT (Brynjolfsson and Mitchell, 2017), and questions the technological optimism of many IS practitioners and researchers. It is useful to think of AI as an intangible type of capital. However, there are tangible counterparts to these intangible expenditures, and in the case of AI, they include increased computing resources such as cloud servers, and even new buildings. The direct cost of AI software may be known, but the cost of these complementary investments and any associated process redesign that may be required is difficult to predict and quantify. For example, the cost of such intangible assets for the computerization wave of the 1990s has been estimated at ten times larger than the direct investments in computer hardware itself. A third, behavioral approach focuses on the unintended consequences in any attempt at IT development (Boland and Lyytinen, 2017), and may therefore be labeled as 'generative' (Rai, Constantinides and Sarker 2019). Whereas this generativity may be leveraged by AI platforms and lead to positive network effects, value creation and scalability, it may also lead to improvisation (Boudreau and Robey 2005) shadow systems (Culnan and Blair 1983), workarounds (Kraut et al. 1999, Azad and King 2008), or loose coupling (Berente and Yoo 2017). The behavioral voice includes criticism of the philosophical underpinnings that often go unstated, yet underlie a given voice.

Issues

The implications of the three critical voices in IS development that we have highlighted, lead to a much more sanguine view of the benefits that AI will deliver. We would like to clarify that when we refer to AI for the purpose of this panel, we view it as AI that is contextualized to a particular domain (e.g., in an organizational function) and akin to the what is commonly known as "weak AI." The voices will be shared within certain business contexts such as healthcare and marketing/sales. For example, a question that may

be raised within healthcare is how to assess whether there is a need for radiologists to check a diagnosis even after Watson has correctly identified the tumor or cancer? And why many patients do not accept the machine's diagnosis without the assessment and confirmation of their physician (Rowe 2018)? In marketing and sales for example, a question may be raised about how to understand why customer service AI robots at China Telecom make so many mistakes even though 700 China Telecom employees spend their time teaching to the machine how to interact with customers (Monod et al 2019 A)? Another question may be why AI sales assistants lead to contrasted results in the USA and in China? More precisely, in the USA, salespersons using AI sales assistants such as Drift or Conversica achieve superior sales performance. But in China, AI sales assistants tend to be used by sales managers to control the salespersons, and therefore have no effect on turnover (Monod et al 2019 B).

In other words, the focus is not on "grand" (and "strong") AI that can perform across multiple contexts and situations, and function more like a generalized human brain. Our position is that these three diverse voices within the IS discipline display different perspectives both with respect to advances in AI and its capabilities within organizations and societies. Given these differing voices, and the general belief that perceptions about AI are often met with confusion, contradictions, and scrutiny, a debate engaging their different perspectives, might begin to provide transformative value for our global society. Issues, concerns and dilemmas that will be raised in the debate will be developed through the three debating voices representing three IS research communities that we have briefly described above as the design, the economic, and the behavioral. In addition to these three debating voices, three dissenting voices will take critical positions on the questions at hand from radically different stances. One dissenting voice will be the humanist, who sees AI as one more way in which the haves use their capital to oppress the working people. Once again, they see those who have contributed so much to the wealth of the world, having it appropriated from them through the accumulation of the capital holders, whose holdings will expand ever more dramatically through the knowledge power of the AI machine. A second dissenting voice will adopt the societal view, who will argue that all the three debating voices within IS are (perhaps) overreacting to the new tools (as in AI), which might be different in appearance from the older and more familiar ones, but not in substance. A third dissenting voice will be an iconoclastic pluralist who will attempt to move beyond labels in challenging the formulations of all other voices from a holistic, meta level. The panel will be composed of two moderators, the three debating voices representing three IS research traditions (design, economics and behavioral), and three dissenting voices (humanist voice, societal voice and iconoclastic pluralist voice). The dissenting voices will join the discussion about midway in the debate and inject provocative commentary against the traditional debating voices that are representing different IS communities.

Coming back to the initial reference of this manuscript, if "being critical is good, but better with philosophy" (Rowe 2018, p. 380), in which respect "philosophizing" brings contrasted perspectives compared to the three aforementioned IS research traditions? Starting with economics, when AI benefit is expected to come from the substitution of machines to human work, is the assumption of this substitution that AI can imitate humans? In this situation, the definition of AI would be consistent with Turing's *imitation game metaphor*, commonly known as the *Turing test* (Turing 1950). But the limitation of this definition, identified by Rowe (2018), is that machines currently have no capacity to compute meaning. Indeed, meaning is not strictly the application of rules to transform some symbols into other symbols (Searle, 1980). If meaning is not about rules, should the definition of meaning be related to the understanding of what one is doing (Obermeier, 1983)? In other words, whereas the problem of meaning is not solved by a definition of humans relying on rational intelligence, how about a pragmatic definition of human? The issue of such a pragmatic definition is that it also applies to animals. As behaviorists argue, animals too are acting. Therefore, which criteria may stand as a grounding of the anthropological difference? What makes us human?

Whereas design sciences represent a pragmatist alternative to the optimistic approach in AI, Winograd (2006) identified another alternative: phenomenology. This philosophy, and more precisely Heidegger's book *Being and Time* (1996) was used by Dreyfus (1972) for criticizing AI. Dreyfus raised the question "what computers can't do" (Dreyfus 1972)? However, the definition of the anthropological difference by Dreyfus only refers to Heidegger's concept of *being-in-the-world*. Even if this definition adds the situated aspect of existence compared to cognitive rationalism, the danger is to fall back into pragmatism. The point of departure of *Being and Time* is indeed a critique of the reification and objectification. "Being" is defined in contrast of what is "objectively present". In order to inquire the meaning of being, Heidegger suggests the concept of *Dasein*, translated either as "presence", or "being-there". *Dasein* is what cannot be objectified.

But the conclusion of Heidegger is that *Dasein* cannot be isolated, as Descartes did with the *ego cogito*. At the opposite, *Dasein* is always not only a *being-in-the world*, but also always "related to beings" (p. 437). Others are part and parcels in the definition of being. As an illustration, in order to define our being, we always relate to others: to our family, to our friends, to our children, to the love of our life, ... or in professional settings, to our customers for salespersons or to our patients for physicians. This very unique mode of being was described by Heidegger as "being-with" [mitsein]. This point was not developed either by Winograd (2006) or Dreyfus (1972), but first by Plato (Rowe, 2018). What is the consequence for AI? The consequence is to move from the definition of AI as an *imitation game metaphor* (Turing 1950) to the definition of AI as a subfield of computer science concerned with *building AI assistants* (Russel and Norvig 2010). The implication of such a definition move is a switch from substitution to *complementarity* (Winograd 2006). In other words, a move from automation of human work to *support* of human work. This approach in AI was called symbiosis or intelligence augmentation (Pavlou 2018). But once again, the aspects not developed by Russel and Norvig (2010), Winograd (2006) or Pavlou (2018) is the importance of others in the anthropological difference. If being is a *being-with* [mitsein], this implies that others are not those that are distinct from me, as Descartes claimed. Others are those from whom one mostly does *not* distinguish oneself. The “with” is the character of our being.

How do these philosophical considerations help to understand the illustrations suggested earlier? Starting with marketing and sales, how to understand that customer services AI robots at China Telecom make so many mistakes with customers that 700 China Telecom employees spend their time teaching to the machine? One explanation is that, for AI, the "with" is not the character of the being of a machine. The identification of the most simple facts that define a situation, referred to as *frames* by Husserl (Dreyfus 1972), can never be learned by a machine. The reason why is that they belong to the uniqueness of a relationship between a human and another human. When salespersons using AI sales assistants (AIA) such as Drift or Conversica in the USA achieve superior sales performance, a clear division of labor is at work between the administrative and transactional tasks performed by the AIA and the relational and negotiation tasks performed by the salespersons. On the other hand, when AI sales assistants in China are used by sales managers to control the salespersons, and therefore have no effect on turnover, these AIA are twisted back into the control and objectification mode and fall back to Cartesianism. In healthcare services, when radiologists are still needed to check the diagnosis provided by Watson, or when many patients do not accept the machine's diagnosis without the assessment and confirmation of their physician another dimension related to Heidegger's *being-with* may be suggested: the relation of *care*. For Heidegger, the meaning of being is provided by others, especially the ones we care of. As opposed to Descartes who searches for truth in an *ego cogito* separated from the world and from the others, the conclusion of Heidegger is that the being of Dasein is *care*. Therefore, *others* and *care* are Heideggerian concepts that stand for a grounding of the definition of the anthropological difference that are incommensurable with machines. Such a perspective indicates research directions for a critique of AI leading to possible modes of symbiosis between humans and machines, at least in healthcare services and marketing and sales.

Panelists –

Although the panelists mainly work in the USA, they reflect the diversity of the discipline through three of the IS research tradition. We sought a variety of seasoned scholars. As a result, we include 3 strong voices to represent the design, economics, and behavioral inspired positions. Our panelists (in our opinion) are not pretenders or compromisers, but each a true believer in their position. The three dissenting voices are also exceptional. In addition, one of the dissenting voices is a Finnish (Kalle Lyytinen) working both in the USA and in Finland, and one of the chairs is a French working in China for 7 years (Emmanuel Monod).

Panel Structure

The Panel has a block of 90 minutes on the program. We scheduled the panel to take about 60 minutes, ensuring that there will be about 30 minutes for audience involvement.

Phase	*Content*	*Duration*	*Linkage between each rounds*
Opening	Moderators introduce the panelists	5 minutes	
Initial Statements by debating voices: Hevner, Gupta, Barrett.	Assessing the state of critical attention to AI by IS scholars.	5 minutes each Total: 15 minutes	Criticizing the new "Age of AI" and the optimism of consulting reports such as the 2018 BCG report. The illustration of question to be addressed will focus on marketing and sales applications of AI, for instance customer support chatbots or AI sales assistants (such as Drift or Conversica). What are the challenges of these AI applications to the future of work of salespersons or sales managers or healthcare professionals? What are the organizational effects? How about the effect on customer satisfaction or retention or service experience?
Second round of debate: Barrett, Gupta, Hevner.	Response to Opening positions & challenge	5 minutes each Total: 15 minutes	This second round is an opportunity to raise a first debate across debating voices, in other words across the three research communities. Beyond contrasting views on the AI illustration, this second round is also an opportunity for each debating voice to clarify the philosophical foundations of their IS research community.
Entry of dissenting voices: Boland, Venkatesh, Lyytinen.	Take critical positions from radically different stances.	5 minutes each Total: 15 minutes	The debate raised by the dissenting voices differ from the debating voices by bringing viewpoints that are not usually included in the IS research communities such as humanist, iconoclastic pluralist and societal voice. They will be however invited to focus on the illustration of AI in marketing and sales or healthcare aforementioned.
Moderators invite comments from audience	Panel, moderators, audience open interaction	30 minutes	The audience is invited to raise any kind of open questions to the panelist or dissenting voices. Short questions rather than long statements will be required. Different questions will be collected before switching to a response round from the panelists in order to make sure that many questions are raised from the audience.
Summary	The moderators will suggest a summary	10 minutes	This summary is intended to highlight the contrasts between the different IS research communities around the interpretation of a precise application of AI such as in marketing and sales or healthcare service, but also their philosophical foundations and, hopefully, some common ground that may help IS to become a reference discipline beyond its diversity.

Table 1: Panel Structure

Participation Statement

All participants have made a commitment to attend the conference and serve if the panel is accepted.

Biographies

Alan R. Hevner is a Distinguished University Professor and Eminent Scholar in the Information Systems and Decision Sciences Department in the Muma College of Business at the University of South Florida. He holds the Citigroup/Hidden River Chair of Distributed Technology. He has published over 250 research papers on these topics and has consulted for a number of Fortune 500 companies. Dr. Hevner is a Fellow of the American Association for the Advancement of Science (AAAS) and a Fellow of the Association for Information Systems (AIS). From 2006 to 2009, he served as a program manager at the U.S. National Science Foundation (NSF) in the Computer and Information Science and Engineering (CISE) Directorate.

Alok Gupta is the Associate Dean of Faculty and Research and Curtis L. Carlson School-wide Chair in Information Management at the Carlson School of Management, University of Minnesota. He was chosen as the Editor-in-Chief of ISR with his first term starting in January 2017. His research has been published in various information systems, economics, and computer science journals such as Management Science, ISR, MIS Quarterly, CACM, JMIS, Journal of Economic Dynamics and Control, Decision Sciences, Journal of Operations Management, Computational Economics, Decision Support Systems, and many other high quality Journals. In addition, his articles have been published in several leading books in the area of economics of electronic commerce. He was awarded a prestigious NSF CAREER Award for his research on dynamic pricing mechanisms on the internet. He served as Senior Editor for ISR and an Associate Editor for Management Science. He has been serving as editor of MIS Quarterly since 2005.

Michael Barrett is Professor of Information Systems & Innovation Studies, Director of Research, and Fellow of Hughes Hall at Cambridge Judge Business School. He is also the Academic Director of Cambridge

Digital Innovation and Distinguished Visiting Professor of Innovation at the Stockholm School of Economics. He has published in many top-tier IS (information systems) and organization journals, and has won several best paper awards at EGOS and the Academy of Management (AOM). In 2016, Michael was awarded the Distinguished Scholar award by the OCIS division of the AOM. Michael is currently (RICK) Section Editor of *Information & Organization* and is on the Advisory Board of the *Journal of the Association of Information Systems*. He has held several editorial responsibilities including: Senior Editor of *MIS Quarterly*, Associate Editor of *Information Systems Research*; Senior Editor of *Information & Organization* and Senior Editor of the *Journal of the Association of Information Systems*. Michael has also served as a member of the Editorial Board of *Organization Science*.

Richard Boland Jr. is the Elizabeth M. and William C. Treuhaft Professor of Management and Professor, Design & Innovation at Case Western Reserve University in 1989. Boland has been fascinated with narrative and design as modes of cognition that are systematically undervalued yet dominate our meaning making. He has over one hundred publications and has twice been recipient of the Best Published Paper Award by the Academy of Management, Organizational Communication and Information Systems (OCIS). In 2015, he received the CWRU Excellence in Teaching and Mentoring Award.

Viswanath Venkatesh is a Distinguished Professor and Billingsley Chair in Information Systems at the Walton College of Business, University of Arkansas. He is widely regarded as one of the most influential scholars in business and economics, both in terms of premier journal publications and citations. His research focuses on understanding the diffusion of technologies in organizations and society. His work has appeared in leading journals in human-computer interaction, information systems, organizational behavior, psychology, marketing, medical informatics, and operations management. Over various periods, including the most recent 5-, 10-, and 15-year periods (e.g., 2013-'17, 2008-'17, 2003-'17), he has been the most productive in terms of publications in the premier journals in information systems (i.e., ISR and MISQ) and best paper awards (e.g., Academy of Management Journal). He has served in editorial roles in various journals including Management Science, MISQ, ISR, Journal of AIS, POM, OBHDP, and DSJ. He is a Fellow of the Association of Information Systems (AIS) and the Information Systems Society, INFORMS

Kalle Lyytinen, is the Iris S. Wolstein Professor of Management Design; chair and professor, design and innovation; and faculty director, doctor of management program. Lyytinen has an extensive list of over 300 publications in numerous prestigious journals including Information Systems Research; Management Information Systems Quarterly; and Organization Science and leading conferences. He is currently among the top five scholars in the information system field by citations (H-index 71). He has presented his work extensively in the U.S. and worked globally at academic institutions including University of Cape Town, ZA; Copenhagen Business School, Denmark; City University of Hong Kong, CPR; Auckland University School of Business, New Zealand; Umea University, Sweden; Aalto University, Finland; and Oslo University, Norway. Professionally, Lyytinen has served as vice president for the Association for Information Systems(AIS), senior editor for Information Systems Research and editor-in-chief for the Journal of the Association For Information Systems. He received an honorary doctorate from Copenhagen Business School in 2016 and from Umea University in 2008. Lyytinen also received the LEO Award from AIS in 2013 and he has numerous Best Paper Awards from AIS (ICIS), HICSS and AoM (OCIS).

Bio of the Panel Moderators

Emmanuel Monod (John), is professor at Shanghai University of International Business and Economics and director of international affairs of the research institute "Artificial Intelligence and Change Management". He was previously professor at Shanghai Jiao Tong University, Antai College of Economics and Management, (China). He was vice-president of the Association for Information System (AIS). He is also the vice-president of the AIS SIG Philosophy of Information Systems. He was recently editorial board member of *ISJ*, *Database* and *ITP* and previously associate editor for *ISR* , *CAIS* and *JAIS*). He published in *Information and Organization, ISJ, EJIS, CAIS, SIM*. He was guest editor of a special issue of *ISJ* and guest associate editor for *MISQ*. He is currently board member of the Academy of Management MC division. He received the MC division best paper award for the conference of the Academy of Management, 2019, Boston, USA. In 2019, he also chaired the Academy of Management MC and OCIS divisions conference on AI at Harvard University

Saonee Sarker is the Rolls Royce Commonwealth Commerce Professor, and Professor of IT at the McIntire School of Commerce in the University of Virginia. She also serves as the Senior Associate Dean at McIntire. Her publications have appeared in outlets such as *MIS Quarterly, Information Systems Research, Journal of Management Information Systems, Journal of the Association of Information Systems, Decision Sciences Journal, European Journal of Information Systems, Decision Support Systems, MIS Quarterly Executive,* and *Information and Management*, among others. Her research has also been funded by the National Science Foundation (NSF). In the past, she has served as an Associate Editor at *MIS Quarterly*, *Decision Sciences Journal*, and *Communications of the AIS*, and has received the Outstanding Associate Editor award at both *MIS Quarterly* and *Decision Sciences Journal*. She currently serves as a Senior Editor of *MIS Quarterly*.

References

Azad B, King N (2008) Enacting computer workaround practices within a medication dispensing system. *European Journal of Information Systems*, 17. 264-278. 10.1057/ejis.2008.14.

Berente N, Yoo Y (2012) Institutional contradictions and loose coupling: Post-implementation of NASA's Enterprise Information System. *Information Systems Research*. 23(2):376-396.

Brynjolfsson E, Mitchell T (2017) What can machine learning do? Workforce implications. *Science*. 358(6370):1530-1534.

Boudreau MC, Robey D (2005) Enacting integrated information technology: A human agency perspective. *Organization Science*. 16(1):3-18.

Culnan M J and Bair JH (1983). Human communication needs and organizational productivity: The potential impact of office automation. *Journal of the American Society for Information Science*, *34*(3), 215-221.

Dreyfus H (1972) What Computers Can't Do: The limits of Artificial Intelligence (MIT Press, Cambridge, MA).

Heidegger M (1996) *Being and Time*. State University of New York

Hevner A, March ST, Park J and Ram S (2004). Design science research in information systems. *MIS quarterly*, *28*(1), 75-105.

Kraut R, Steinfield C, Chan AP, Butler B, Hoag A (1999) Coordination and virtualization: The role of electronic networks and personal relationships. *Organization Science* 10(6):722-740.

Manyika J (2017). A future that works: AI automation employment and productivity. *McKinsey Global Institute Research, Tech. Rep.*

Monod E, Berente N and Qi J (2019 A) AI in customer service at China Telecom, *unpublished manuscript*.

Monod E, Sarker S, Straub DW, Sidorova A, and Qi J (2019 B) AI sales assistants in China: the case of Sensee, *unpublished manuscript*.

Obermeier, K (1983). Wittgenstein on language and artificial intelligence: The chinese-room thought experiment revisited. *Synthese*, 56(1983), 339–349

Pavlou PA (2018) Internet of Things–Will Humans be Replaced or Augmented? *GfK Marketing Intelligence Review* 10(2): 43-48.

Rai A, Constantinides P and Sarker S (2019). Editor's Comments: Next-Generation Digital Platforms: Toward Human–AI Hybrids. *Management Information Systems Quarterly*, *43*(1), pp.iii-ix.

Ransbotham S, Gerbert P, Reeves M, Kiron D and Spira M (2018). Artificial intelligence in business gets real. *MIT Sloan Management Review and The Boston Consulting Group.*

Rowe F (2018). Being critical is good, but better with philosophy! From digital transformation and values to the future of IS research. *European Journal of Information Systems*, *27*(3), pp.380-393.

Russell S, Norvig P (2010) *Artificial Intelligence: A modern approach,* 3rd ed. (Pearson Publishing, London).

Simon HA (1996). *The sciences of the artificial*. MIT press

Searle, J (1980). Minds, brains, and programs. *Behavioral and Brain Sciences*, 3(3), 417-424.

Turing AM (1950) Computing machinery and intelligence. *Mind. A Quarterly Review of Psychology and Philosophy*. LIX(236): 433–460.

Weizenbaum J (1976) Computer power and human reason: From judgment to calculation.

Winograd T (2006) Shifting viewpoints: Artificial intelligence and human–computer interaction. *Artificial Intelligence* 170(18):1256-1258.